DESIGN OF EXPOSED AGGREGATE SEAL COATS

(An Arizona Method)

SCOPE

1. (a) This method describes the procedure for calculating design quantities of materials for exposed aggregate seal coats utilizing cover aggregates and emulsified asphalt. The resultant quantities are to be adjusted for field conditions, as necessary.

(b) See Appendix A1 of the Materials Testing Manual for information regarding the procedure to be used for rounding numbers to the required degree of accuracy.

(c) Metric (SI) units and values are shown in this test method with English units and values following in parentheses. Values given for metric and English units may be numerically equivalent (soft converted) for the associated units, or they may be given as rounded or rationalized values (hard converted). Either the metric or English units along with their corresponding values shall be used in accordance with applicable specifications. See Appendix A2 of the Materials Testing Manual for additional information on the metric system.

DATA

2. The following values are to be determined by the method indicated:

H = Average least dimension of cover aggregate (Median Aggregate size modified for Flakiness Index - Arizona Test Method 233).

G = Bulk Specific Gravity (Arizona Test Method 210 - Saturated surface dry basis).

R = Residual bitumen of emulsified asphalt, expressed as a decimal (AASHTO T 59).

T = Traffic factor from the following:

When the ADT is less than or equal to 2000,
T = 0.85 - [0.0001(ADT)]

When the ADT is more than 2000, T = 0.65

NOTE: Traffic must be considered by lanes - for instance on a divided highway, the passing lane and distress lanes should have a higher traffic factor than the travel lane.

E = Wastage factor due to cover aggregate lost to whip off by traffic and to variation in spread (1 + Estimated Waste, for example, 1.05 for 5% wastage).

V = Voids in Aggregate by the following:

Metric:

$$V = 1 - \frac{W_L}{(998)\,(G)}$$

Where: W_L = Loose unit weight of aggregate in kg/m^3 by AASHTO T 19 (Shoveling Procedure).

English:

$$V = 1 - \frac{W_L}{(62.3)\,(G)}$$

Where: W_L = Loose unit weight of aggregate in lbs./cu. ft. by AASHTO T 19 (Shoveling Procedure).

S = Surface Texture Correction from below:

Surface Texture	Surface Texture Correction	
	liters/square meter	gals./sq. yd.
Very Porous	0.41	0.09
Rough and Porous	0.27	0.06
Slightly Rough, Black	0.14	0.03
Black and Smooth (Hard, no aggregate embedment predicted)	0.00	0.00
Soft and Rich (Aggregate embedment predicted)	-0.05* to -0.23*	-0.01* to -0.05*
	* Depending upon aggregate embedment estimation.	

CALCULATIONS

3. The required amount of cover material and bituminous material shall be calculated by the following:

(a) Cover Material Requirement:

Metric:

For 100% pass 9.5 mm sieve,

$$C = [0.6163\ (G)\ (H)\ (E)]\ (2 - V)$$

For 100 % pass 12.5 mm sieve,

$$C = [0.5078\ (G)\ (H)\ (E)]\ (2 - V)$$

Where: C = Cover Material in kg/m^2

Convert cover material from kg/m^2 to m^3/m^2 by the following equation:

$$\frac{C(\text{in } kg/m^2)}{W_L\ (\text{in } kg/m^3)} = C\ (\text{in } m^3/m^2)$$

English:

For 100% pass 3/8" sieve,

$$C = [28.4\ (G)\ (H)\ (E)]\ (2 - V)$$

For 100 % pass 1/2" sieve,

$$C = [23.4\ (G)\ (H)\ (E)]\ (2 - V)$$

Where: C = Cover Material in lbs./sq. yd

Convert cover material from lbs./sq. yd. to cubic yards per square yard by the following equation:

$$\frac{C \text{ (in lbs./sq. yd.)}}{[W_L \text{ (in lbs./cu. ft.)}] \times 27}$$

(b) Bituminous Material Requirement:

Metric:

$$B = \frac{0.3622\ (H)\ (T)}{R} + S$$

Where: B = Bituminous Material in L/m^2

English:

$$B = \frac{2\ (H)\ (T)}{R} + S$$

Where: B = Bituminous Material in gals./sq. yd.

EXAMPLE

4. The following example will serve to illustrate the calculations:

(a) Data:

H = 5.50 mm
G = 2.630
R = 0.65
T (for 1500 ADT) = 0.85 - [0.0001 (1500)] = 0.70
E = 1.06

$V = 0.46$ ($W_L = 1418$ kg/m^3)
S = Rough and Porous = 0.27 L/m^2

(b) Cover Material Requirement:

For 100% pass 12.5 mm sieve,

$$C = [0.5078\ (G)\ (H)\ (E)]\ (2 - V)$$
$$= [0.5078\ (2.630)\ (5.50)\ (1.06)]\ (2 - 0.46)$$
$$= 11.99\ \text{kg/m}^2$$

Convert 11.99 kg/m^2 to m^3/m^2 by:

$$\frac{11.99\ \text{kg/m}^2}{1418\ \text{kg/m}^3} = 0.008\ \text{m}^3/\text{m}^2$$

(c) Bituminous Material Requirement:

$$B = \frac{0.3622\ (H)\ (T)}{R} + S$$

$$= \frac{0.3622\ (5.50)\ (0.70)}{0.65} + 0.27$$

= 2.42 liters per square meter

REPORT

5. Report the following:

(a) The amount of cover material required, in kg/m^2 (lbs./sq. yd.), to the nearest 0.01 kg/m^2 (0.1 lbs./sq. yd.).

(b) The amount of cover material required, in m^3/m^2 (cubic yards per square yard), to the nearest 0.001 m^3/m^2 (0.001 cubic yards per square yard).

(c) The amount of bituminous material required, to the nearest 0.01 L/m^2 (0.01 gals./sq. yd.).